ENDGAME

VERSION 2 | 29/04/2026

Decarbonising Transport

The Electrification of Freight

DESCRIBE, UNDERSTAND, MODEL, SOLVE

ENDGAMEANALYTICS.COM.AU

Contents

01

Executive Summary

Battery electric trucks are reaching cost parity for long-haul freight

Endgame Analytics is undertaking a research series on decarbonising transport, exploring the interactions between policy, technology, and economic strategy.

The transition from internal combustion engines (ICE) to battery electric vehicles creates a nexus between the electricity sector and road transport. This establishes a bi-directional relationship where charging behaviour impacts the grid, and electricity market dynamics dictate the cost of transport.

This paper forms the second instalment of our series, focusing on the road freight task. Specifically, we assess the financial viability of electrifying long-haul freight, putting aside charging and regulatory barriers.

We Found:

Modelling a 1,000-kilometre B-double truck movement between Brisbane and Sydney demonstrates that battery electric trucks (BETs) can achieve operator cost parity with diesel incumbents.

Operational savings in energy and maintenance may offset the upfront capital premium of BETs. Off-peak charging schedules deliver a 6% cost reduction compared to a diesel baseline, while charging during peak demand periods renders the electric alternative 1% more expensive.

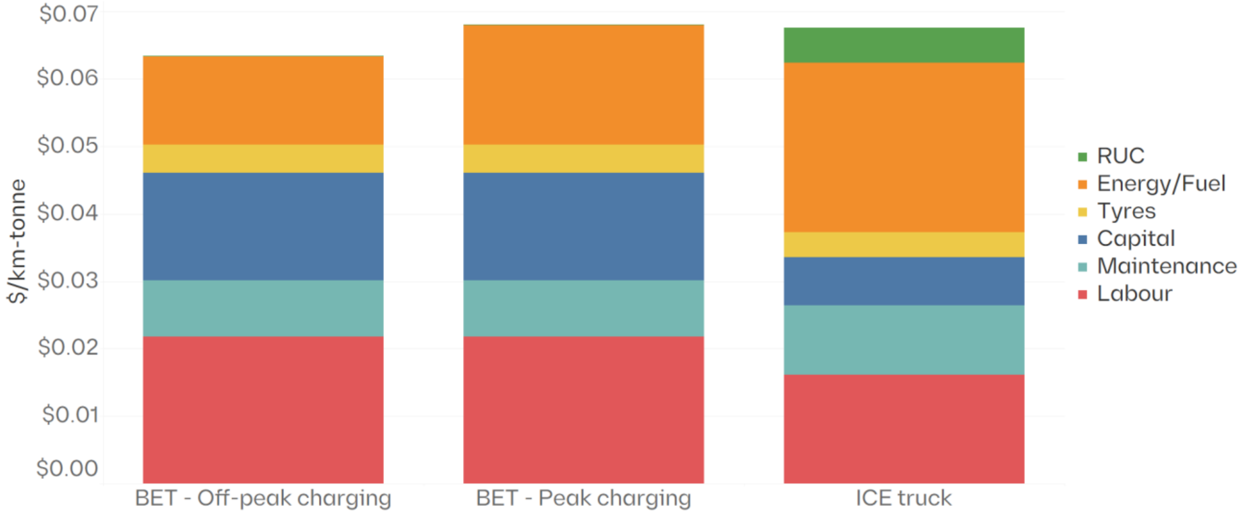
ICE Truck
Cost per trip: $2,625
Cost per tonne-km: 6.76 cents

BET Off-peak charging
Cost per trip: $2,146
Cost per tonne-km: 6.34 cents

Cost competitiveness relies heavily on travel distance, with baseline parity achieved at approximately 700 kilometres per day. Longer distances amortise the higher vehicle acquisition cost over a large volume of revenue kilometres, making the unit cost per tonne-kilometre relatively insensitive to initial capital expenditure.

The economic threshold for parity is highly sensitive to external fuel markets. Under scenarios of sustained high diesel prices, the required daily travel distance to achieve cost parity falls to under 300 kilometres.

Cost stack of a BET and ICE truck for a 1000km Brisbane to Sydney trip

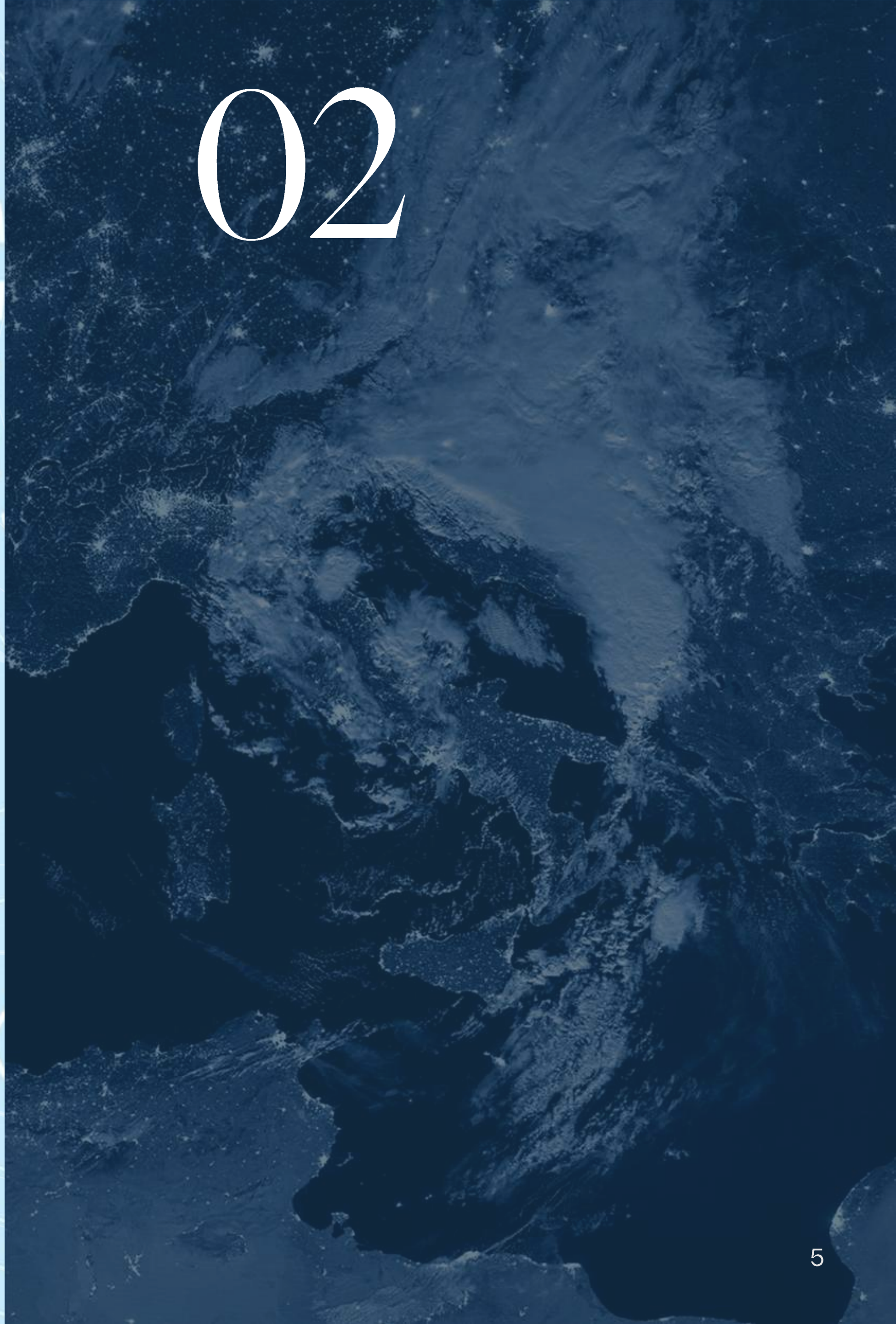


The Australian road freight task is projected to grow by 77% by 2050. Achieving national Net Zero commitments therefore requires the accelerated transition of an ageing, diesel-dependent fleet towards zero-emission technologies.

Widespread adoption faces structural barriers, including a lack of high-capacity charging infrastructure, regulatory misalignment, and a highly fragmented logistics market operating on thin margins. Resolving these challenges necessitates coordinated government intervention, encompassing capital support, public charging investment, and regulatory reform.

Despite these hurdles, heavy vehicle electrification likely presents a commercially viable decarbonisation pathway. The convergence of the transport and electricity sectors unlocks operational efficiencies through strategic charging and active participation in the energy market.

We would like to extend our gratitude to Parry Serafim (Powering Australia), Ed McGeehan, and Aidan McGann (Mountain Vista Advisory Pty Ltd) for their expert review and constructive feedback, which greatly strengthened the analysis presented in this paper. We would also like to thank Brook Hall, Dr Daniel Ainalis, Dr Robert Kochhan, and David Green (National Transport Research Organisation) for their time and insight, which informed the development of our thinking.



02

Introduction

Road freight decarbonisation: a case for change

Australia's road freight industry powers the nation's economy. Despite a relatively small population, the sector achieves a remarkable feat, moving the seventh-largest volume of freight in the Organisation for Economic Co-operation and Development (OECD)[1]. Contributing 8.6% to our national GDP[2], trucks traverse vast distances to connect remote communities with global markets, moving 223 billion tonne-kilometres of freight in 2019-20[3].

The need to decarbonise

The transport sector is currently Australia's third-largest emitter, accounting for approximately 22% of national emissions[4], and commercial road transport is responsible for 43% of this total[5]. With the national freight task projected to grow by 77% by 2050[3], decarbonising this sector is necessary for meeting Australia's net zero climate goals.

But there are structural barriers to the uptake of electric trucks

Electric trucks represent a pathway for the decarbonisation of the road freight sector. While the uptake of electric passenger vehicles is accelerating, the electrification of Australia's heavy vehicle fleet remains in its infancy with a number of key barriers to adoption. The industry is highly fragmented; 98% of trucking operators are small or family businesses, and 70% own only a single truck[6]. The combination of a fragmented market and operating profit margins averaging a thin 2%[7] creates financial constraints that hinder investment in fleet upgrades and technology adoption. Consequently, many operators are not well positioned to fund this transition.

Operators also face productivity impacts that must be managed. Unlike flexible diesel equivalents, battery electric trucks (BETs) require vehicle specifications to be explicitly tailored to specific duty cycles. Maintaining productivity and meeting service delivery contracts requires the careful alignment of tare mass, payload limitations, range, and driver rest breaks with charging requirements. While this tailored approach is advancing within the light commercial sector, it remains a hurdle for heavier vehicles.

These operational challenges are compounded by industry experience. The freight sector relies on entrenched expertise in diesel propulsion, meaning a lack of driver training and skilled BET mechanics acts as a barrier to entry. Furthermore, limited public charging availability, restrictive regulatory arrangements, and constrained vehicle model availability represent hardware and policy hurdles. Despite these barriers, growing uncertainty regarding oil security and diesel costs may serve as a catalyst for operators to explore electrification to mitigate fuel supply risks.

This paper assesses the prevailing narrative that long-haul freight is hard to electrify due to structural and financial constraints. We analyse the commercial feasibility of BETs by modelling the total cost of an interstate freight movement, comparing baseline diesel vehicles against electric alternatives. The findings demonstrate that face-value cost comparisons are changing rapidly and that cost parity for the transition to long-haul BETs may not be far away. With the strategic deployment of charging infrastructure, electrifying Australia's heaviest freight tasks is an emerging economic reality.

---

[1] AECOM 2024. *Electrifying Road Freight, page 2.* [2] The Department of Infrastructure, Transport, Regional Development, Communications, Sport and the Arts. *Freight & supply chains*. [3] Bureau of Infrastructure and Transport Research Economics 2022. *Australian aggregate freight forecasts – 2022 update, page iv.* [4] Department of Climate Change, Energy, the Environment and Water 2025. *Reducing transport emissions*. [5] Climate Change Authority 2024. *Transport, page 3.* [6] Electric Vehicle Council 2022. *Electric trucks: Keeping shelves stocked in a net zero world, page 5.* [7] AECOM 2024. *Electrifying Road Freight, page 6.*

Internal combustion dominates Australia's freight task, though emerging electric models present a transition pathway for logistics providers

The freight task ahead

Since 1970, national freight volume has quadrupled, with road freight expanding eight-fold. Demand on this network is projected to intensify from the current 223 billion to 394 billion tonne-kilometres by 2050, highlighting the need to decouple this growth from carbon emissions.[1]

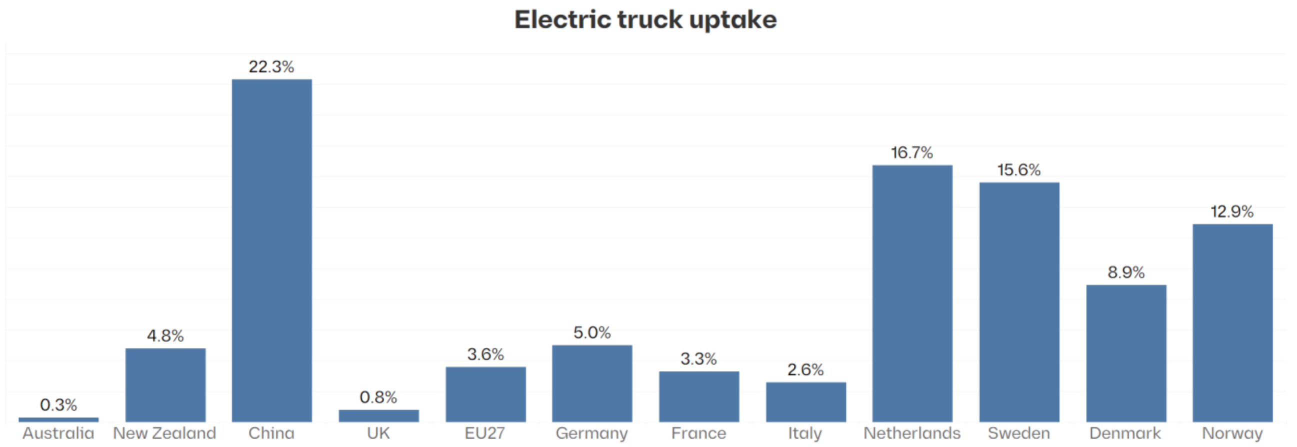
Australia's ageing fleet

The Australian truck fleet averages 10 to 15 years old, lagging international benchmarks like Austria (6.4 years), France (9.3), and Germany (9.5)[2]. The sector relies on multiple ownership lifecycles, passing from initial fleets to secondary owners with lower capital costs and utilisation. This ownership structure helps small trucking businesses remain competitive against larger operators. Yet, this delayed fleet renewal embeds structural inertia, as older vehicles consume more fuel, produce higher emissions, and lack modern telematics. To achieve national 2050 Net Zero commitments, this trajectory needs to shift, requiring new internal combustion engine (ICE) truck sales to cease by 2040[2].

What are the current BET options

In 2025, there were 5 electric prime movers and 22 electric rigid truck models (plus variants) available in Australia[3]. These models are capable of servicing urban and intrastate freight tasks, with urban operations increasingly demonstrating price parity, while technology for long-haul heavy haulage continues to develop. Options capable of operating in a B-double configuration remain limited to emerging international models from manufacturers such as Scania and Windrose. However, these vehicles have so far only operated domestically under permit in trials and are not yet fully compliant with Australian Design Rules or axle mass limits.

Several logistics companies have established electric fleet commitments as detailed in the table. ARENA's Driving the National Fund also provides funding to demonstrate and deploy heavy vehicles, charging solutions, and other innovation supporting uptake of BETs.



Operator	Commitment Target[4]	Target Fleet	Current Fleet	Progress
Woolworths	100% electric home deliveries by 2030	1,200+	75	~6.3%
IKEA	90% of third-party home deliveries by 2028	100+	~60	~60.0%
ANC Delivers	30% of last mile delivery fleet by 2028	Unspecified	~72	Unspecified
Australia Post	50% of last mile deliveries	5,000+	Unspecified	Unspecified
TGE	Fleet transition over three years in NSW, VIC and QLD	300+	~60	~20.0%
Mainfreight	10% metro fleet by 2030 (100 globally by 2029)	100	Unspecified	Unspecified

---

[1] Bureau of Infrastructure and Transport Research Economics 2022. *Australian aggregate freight forecasts – 2022 update, page xiv.* [2] Electric Vehicle Council 2022. *Electric trucks: Keeping shelves stocked in a net zero world, page 4.* [3] Electric Vehicle Council 2025. *State of Electric Vehicles, page 52.* [4] mov3ment 2025. *Electric Truck Report, page 5.* [5] Electric Vehicle Council 2025. *State of Electric Vehicles, page 24*

Declining battery costs and scale economies are shifting the outlook for electric freight competitiveness

Existing research on freight decarbonisation

The prevailing literature on road freight decarbonisation is mixed regarding the economic feasibility of BETs. Some literature[1] leans towards a pessimistic outlook for the heavy-duty segment, where the Total Cost of Ownership (TCO) for heavy-BETs are consistently more expensive in the near term. Consequently, forecasts suggest adoption in this vehicle class will lag behind light and medium-duty counterparts, a delay primarily attributed to prohibitive upfront capital acquisition costs and payload penalties (reduced freight capacity due to heavy batteries).

Conversely, alternative models present a more optimistic view. Certain European-based studies [2,3] indicate that light-duty BETs have already reached TCO parity, projecting that heavy-duty variants will become cost-competitive in the 2030s. This optimism is predicated on technological improvements, economies of scale in vehicle manufacturing, diesel cost increases, and decreases in battery pack costs.

Existing literature often frames the choice between diesel trucks and BETs as a simple trade-off, where BETs offer lower energy and maintenance costs against higher capital expenditure and reduced range. However, as emission reduction targets necessitate a sector-wide transition, a diesel truck acts as only a partial and time-limited substitute. Consequently, the remaining economic lifespan of a cost-competitive diesel vehicle may prove to be significantly shorter than the current average age of the Australian fleet.

Limitations in existing research

Current literature presents limitations, particularly concerning operational energy modelling. Most conventional TCO models do not account for how payload penalties, extended charging times, and range limits interact with real-world duty cycles. Furthermore, charging behaviour influences the cost of using BETs, but current analyses commonly treat electricity as a static cost based on retail prices. This methodology does not account for the underlying dynamics of wholesale electricity markets and network tariffs.

By treating energy costs as static, existing research does not factor in the strategic opportunity for freight operators to charge during low-cost periods. While dynamic pricing offers a theoretical advantage to travel time and charging to minimise costs, this flexibility must be tempered by commercial reality. Although some duty cycles are adaptable, some freight operations must remain strictly responsive to customer demand and existing service delivery obligations.

Furthermore, there is limited research in the Australian context. Australia presents different logistical challenges characterised by vast distances between major economic centres, and specific heavy vehicle mass and dimension regulations. Addressing the existing literature gap requires a localised model that integrates dynamic energy market pricing with the physical and regulatory realities of the Australian interstate freight task.

Diesel Truck		**Battery Electric Truck**
Route flexibility and range	Pros	Energy arbitrage and V2G opportunity
High payload capacity		Low variable operating costs
Vehicle availability and low capital costs		Simplified drivetrain servicing
Proven long-haul reliability		Zero tailpipe emissions
Mechanical wear and tear	Cons	Current regulatory misalignment
Urban amenity and curfew restrictions		Charging times
Regulatory obsolescence risk		Supporting infrastructure requirements
Exposure to global fuel price shocks		First-mover technology risks

---

[1] Danielis et al. 2025. *The Economic Feasibility of Battery Electric Trucks: A Review of the Total Cost of Ownership Estimates.* [2] International Transport Forum 2022. *Decarbonising Europe's Trucks How to Minimise Cost Uncertainty.* [3] EY-Eurelectric 2026. *Fleet forward: powering the transition to electric mobility.*

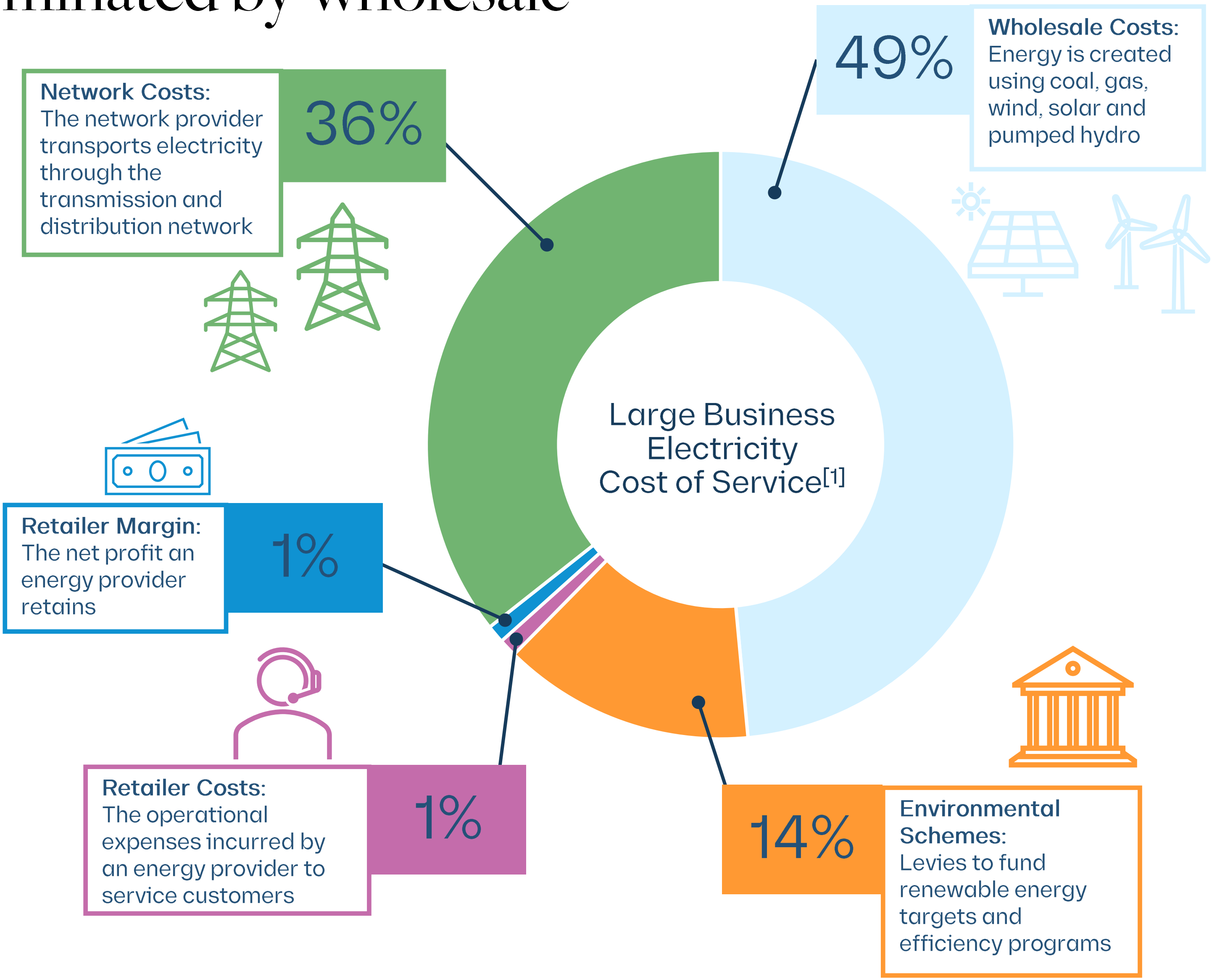
The electricity supply chain is dominated by wholesale and network costs

The cost of charging a BET is governed by the electricity cost stack, comprising wholesale, network, environmental, and retailer costs.

This paper uses costings from New South Wales (NSW) region for 2026 as a case study to model wholesale and network dynamics. While regional variations in generation mix and climate exist, the core findings remain applicable across the National Electricity Market (NEM).

The accompanying chart illustrates the annual cost breakdown for a large commercial enterprise, representative of a freight operator considering fleet electrification. Wholesale and network components constitute 85% of the total cost stack and form the primary focus of our analysis. Retail costs and margins represent a proportionately small fraction for large commercial users when compared to retail users due to economies of scale from high-volume electricity consumption. Further, environmental schemes are generally recovered via network costs.

We provide a more detailed discussion about the NEM in our previous research paper. A link to the paper is available here.



Large Business Electricity Cost of Service[1]

Network Costs: The network provider transports electricity through the transmission and distribution network — 36%

Wholesale Costs: Energy is created using coal, gas, wind, solar and pumped hydro — 49%

Retailer Margin: The net profit an energy provider retains — 1%

Retailer Costs: The operational expenses incurred by an energy provider to service customers — 1%

Environmental Schemes: Levies to fund renewable energy targets and efficiency programs — 14%

---

[1] ACCC 2021. *Inquiry into the National Electricity Market, page 4.*

03

Case Study

We model a B-double travelling 1000 km a day

We model a long-haul trip between Brisbane and Sydney, comparing a standard diesel ICE prime mover against a BET. The analysis focuses on a B-double configuration. We have selected this given that non-urban road freight accounts for 65% to 70% of total road freight tonne-kilometres in Australia[1], a task heavily reliant on B-doubles. We have modelled the general mass limit (GML) as there are a limited number of BETs that can operate at higher mass limits (HML) at B-double configuration[2].

Truck specifications

We have estimated total cost of ownership (TCO) for diesel truck based on available literature, including sources such as Australian Trucking Association's (ATA) Truck Impact Chart and National Transport Commission's (NTC) heavy vehicle operating cost model.

Standard specifications for heavy-duty BETs are still emerging, particularly for heavy vehicles with gross combination mass (GCM) of 60 tonnes and above. As such, there is a high degree of uncertainty about standard specifications that should apply when doing a TCO analysis. We have made assumptions based on our analysis of several information sources, including Association of European Vehicle Logistics' report on costs of electric trucks, the International Council on Clean Transportation's TCO calculator and our analysis of vehicles available overseas.

Key specifications are provided in the summary table. When comparing the two prime movers, the model accounts for several critical operational and financial variances:

Payload Penalty: We assume GML apply to both the ICE and BET combinations. Consequently, the commercial payload capacity of the BET is directly reduced by the additional tare mass given the required battery systems.

Capital Cost and residual value: We assume that there is a 300% price premium for an electric prime mover and residual value of this prime mover is 0%

Energy consumption: We have estimated the implied energy efficiency of BETs based on available specifications. We have included an additional allowance to account for difference between advertised specifications and those experienced in real world driving conditions.

	ICE Truck	Battery Electric Truck
Payload	38.9t	33.9t
Capital cost (trailer and prime mover)	$653k	$1.12m
Residual value	31%*	0% for prime mover** , 31% for trailer
Useful life	9 years	9 years
Maintenance	$0.4/km	$0.28/km
Labour costs	$56/hour	$56/hour
Fuel/energy consumption	62 L/100km	1.80 kWh/km
Fuel/energy price	$2 per litre	Detailed on slide 14 and 15
Advertised range	NA	375 km
Charge rate	NA	450 kW

*The residual value of legacy diesel vehicles is subject to change given the introduction of emission caps and stranded asset risks. **BET residual values are expected to increase as the transition accelerates, making this current assumption conservative. Tyre costs are more expensive for BET due to extra tare weight. We have not accounted for this in our analysis but do not expect this to make a material difference to our results.

---

[1] Bureau of Infrastructure and Transport Research Economics 2022. *Australian aggregate freight forecasts – 2022 update, page 7.* [2] While some jurisdictions offer a 2-tonne mass concession, this allowance is largely restricted to HML networks, with the exception of NSW. Consequently, any comparative payload advantage is negated, as diesel equivalents already operate at increased capacities on these corridors.

We model a primary freight route along Australia's eastern seaboard

The Brisbane to Sydney trip is ~1000kms with three charging breaks

The operational model for this case study evaluates the Brisbane to Sydney corridor, the primary freight route along Australia's eastern seaboard. Spanning 900 to 1000 km, this route presents a prevailing operational challenge for BETs due to current battery range limitations.

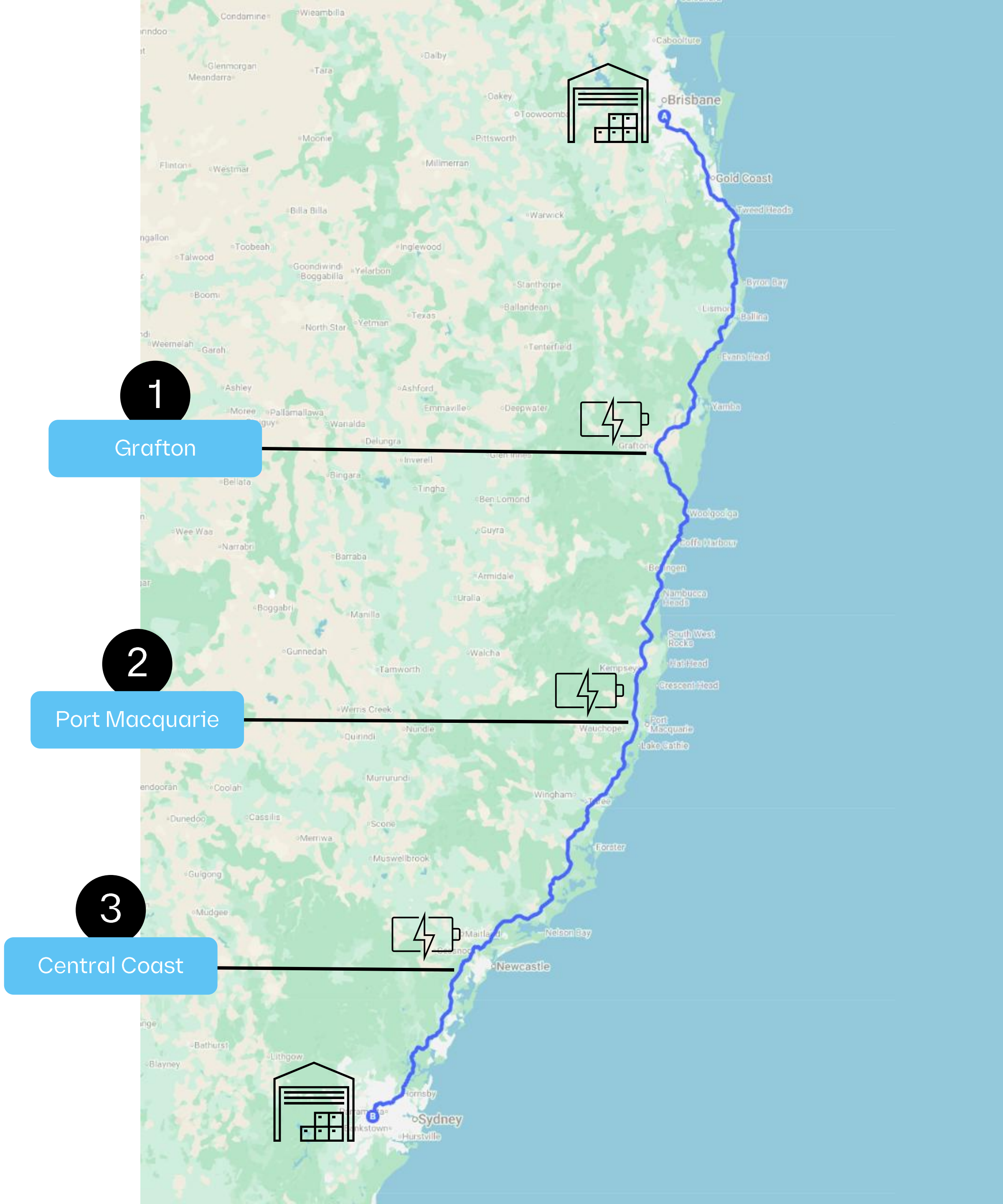
The supply chain begins with freight arriving at the Port of Brisbane, which is subsequently processed at a distribution hub south of the city. The freight is loaded onto a fully charged B-double BET, departing for a destination distribution centre in South Western Sydney. Upon arrival at the Sydney distribution hub, the freight is cross-docked onto light commercial vehicles for last-mile urban delivery, representing the final leg of the supply chain.

Charging is done after 3 hours of driving (270 km) and requires 1 hour

Charging is done after 3 hours of driving (270 km) and requires 1 hour. We have assumed that average travel speed for the trip to be 90 km/h. The vehicle requires three en-route charging events spaced at approximately 270 km intervals. Assuming an available charging infrastructure capacity of 450 kW, each stop requires approximately one hour of dwell time. These could be located in Grafton, Port Macquarie and the Central Coast.

For an ICE truck, the drive time would be around 11 hours, plus a 1-hour fatigue break. For a BET, the drive time is still 11 hours, plus 3 hours to recharge the vehicle. For this analysis, we have assumed that 1 hour of recharging time is unpaid as the driver is on a break, but the other 2 hours are paid. Both vehicles are assumed to operate 300 days a year on a single shift basis, completing one directional trip per day. While double shifting can occur on this corridor to maximise asset utilisation, this analysis uses a single shift to explicitly compare the operational costs of a single duty cycle.

	ICE Truck	Battery Electric Truck
Total distance	1000 km	1000 km
Driving time	11 hr	11 hr
Down time	1 hr (unpaid mandated rest break)	3 hr (1 hr unpaid fatigue break and 2 hr paid charging time)
Total trip time	12 hr	14 hr



The charging cost model applies regional network tariffs and dynamic wholesale pricing

Charging events occur within NSW and are subject to regional wholesale and network pricing. The analysis applies network tariffs from Essential Energy, the Distribution Network Service Provider (DNSP) covering much of regional NSW. This network typically features higher capacity and network usage charges compared to other urban counterparts.

The charging cost model incorporates specific inputs:

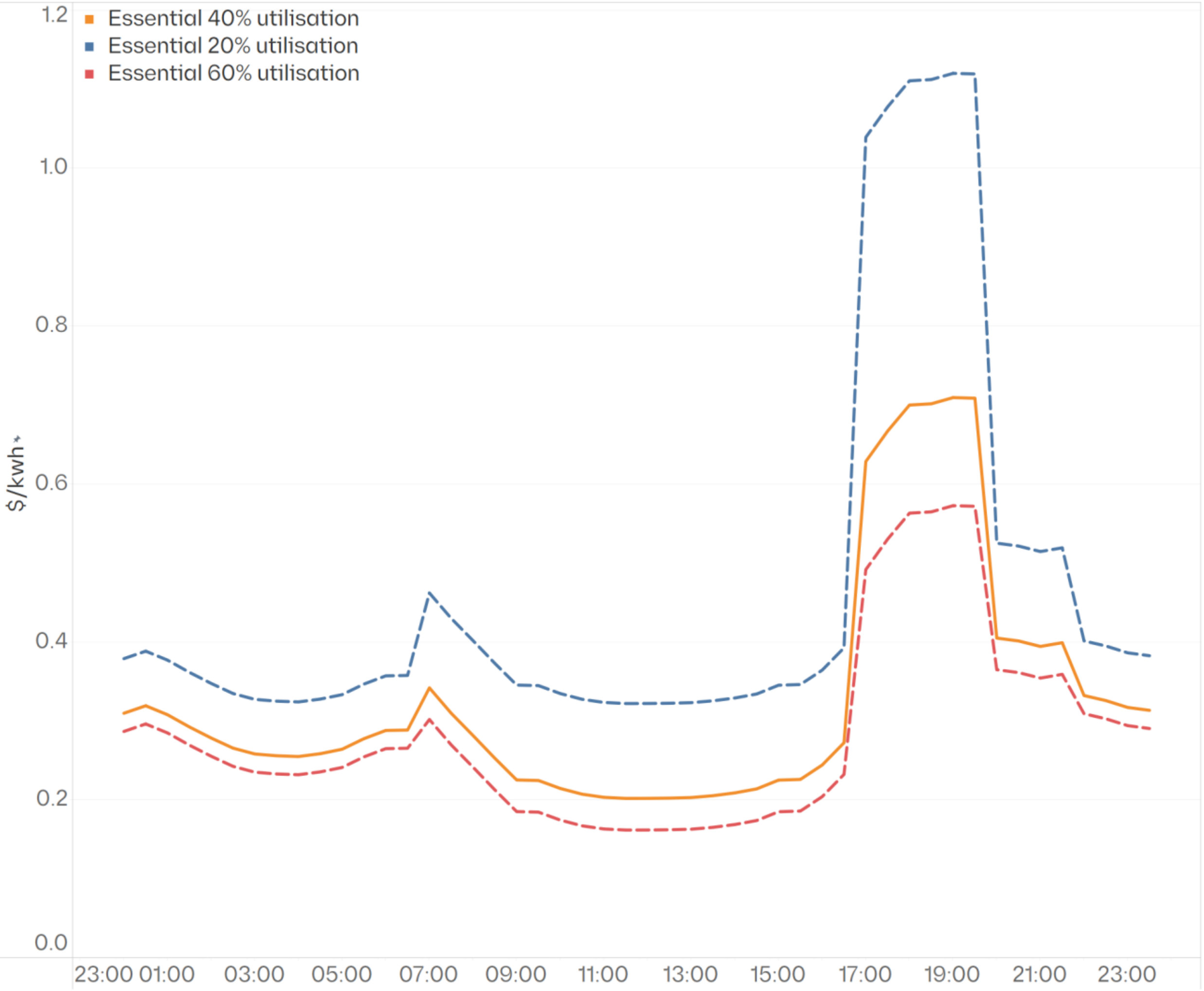
- Wholesale costs: Derived from Endgame's electricity market modelling.
- Network costs: Based on Essential Energy's published tariffs, capturing both daily access and capacity charges.
- Installation costs: Estimated at $300,000 per charging bay, amortised over a 10-year useful asset life.
- Retail cost and margin: Assumed to be 5% applied atop all combined energy and network costs.
- Cost allocation: Fixed network and infrastructure installation costs are distributed across multiple users.

The model assumes a central case 40% utilisation rate per charging bay (equating to 9.6 hr of active charging per day). These fixed costs are then allocated to the specific freight trip on a per-kWh basis. Charging utilisation will vary markedly depending on the total volume of BETs and the specific freight route. Corridors with lower overall freight volumes may not commercially support high-capacity infrastructure, resulting in the deployment of fewer or lower kilowatt chargers. This would inherently increase charging dwell times and negatively impact time-sensitive delivery schedules.

The resulting underlying energy cost stack is sensitive to the time of charging. Costs are generally lowest between 10 am to 4 pm when solar generation is high. Conversely, costs peak significantly during the evening demand window from 17:00 to 20:00.

Given this time-of-day market volatility, some operators may seek to lock in fixed retail pricing arrangements, thereby passing on risk. However, this will come at a higher cost to compensate the counter-party taking on these risks.

Average cost of charging a BET based on wholesale, network, and retail margin for 2026



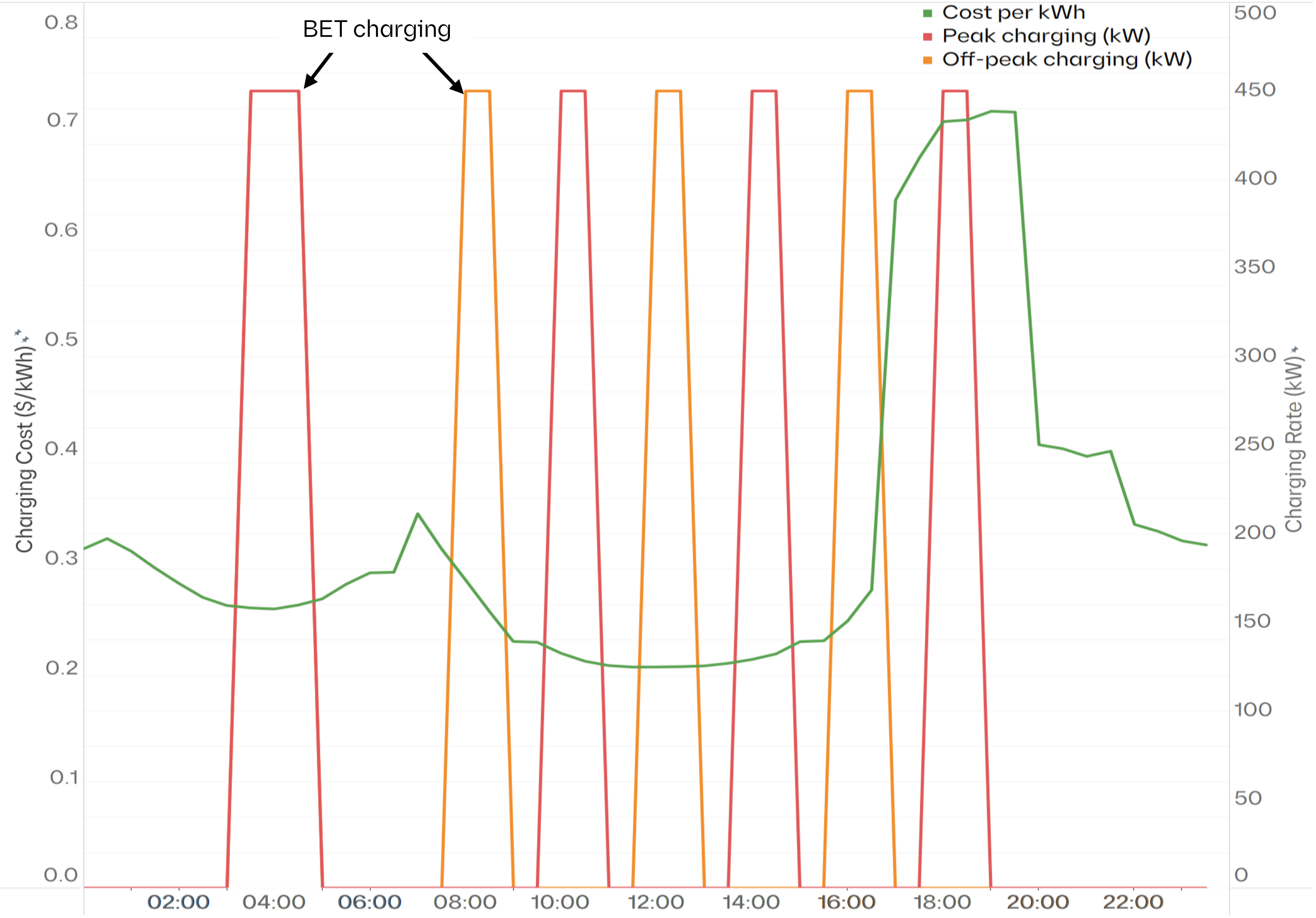
Both peak and off-peak charging profiles offer substantial energy cost savings over diesel

The time-of-day nature of costs mean that the charging schedule is an important driver of energy costs. To quantify this impact, the analysis models two distinct charging scenarios for the route:

- Off-peak charging: En-route charging events are scheduled to avoid the 17:00 to 20:00 peak demand window. The weighted average energy cost in this scenario is $0.25 per kWh, resulting in a total charging cost of approximately $445 per trip.
- Peak charging (schedule constrained): Charging events overlap with the evening peak period, reflecting an inflexible freight schedule. This increases the weighted average energy cost to $0.33 per kWh, raising the total trip energy cost to around $600 per trip.

Both BET scenarios represent a substantial reduction in direct energy expenditure when benchmarked against legacy technology. For comparison, the fuel-related costs of travelling a standard 1,000 km route in a diesel truck total approximately $1,176, inclusive of the heavy vehicle road user charge (RUC) and assuming fuel price of $2 per litre.

Peak and off-peak charging profiles overlayed on price trace



Energy and maintenance savings offset the capital and labour penalties of electric long-haul freight, provided charging is optimised

The comparative cost model indicates that BETs are potentially cost competitive when compared to diesel equivalents.

- Off-peak charging: The BET delivers a saving of 0.4 cents per tonne-kilometre, representing an 6% cost reduction compared to the ICE baseline.
- Peak charging: When charging occurs during the more expensive evening peak period, the BET is 0.1 cents per tonne-kilometre more expensive (1%) when compared to the diesel equivalent.

These results arise because reductions in direct energy and maintenance costs are potentially high enough to offset higher capital costs, the increase in labour costs due to charging dwell time, and payload penalty.

ICE Truck

Cost per trip: $2,625

Cost per tonne-kilometre: 6.76 cents

BET Peak charging

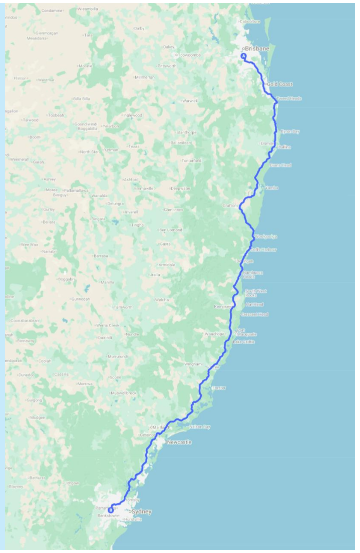
Cost per trip: $2,304

Cost per tonne-kilometre: 6.81 cents

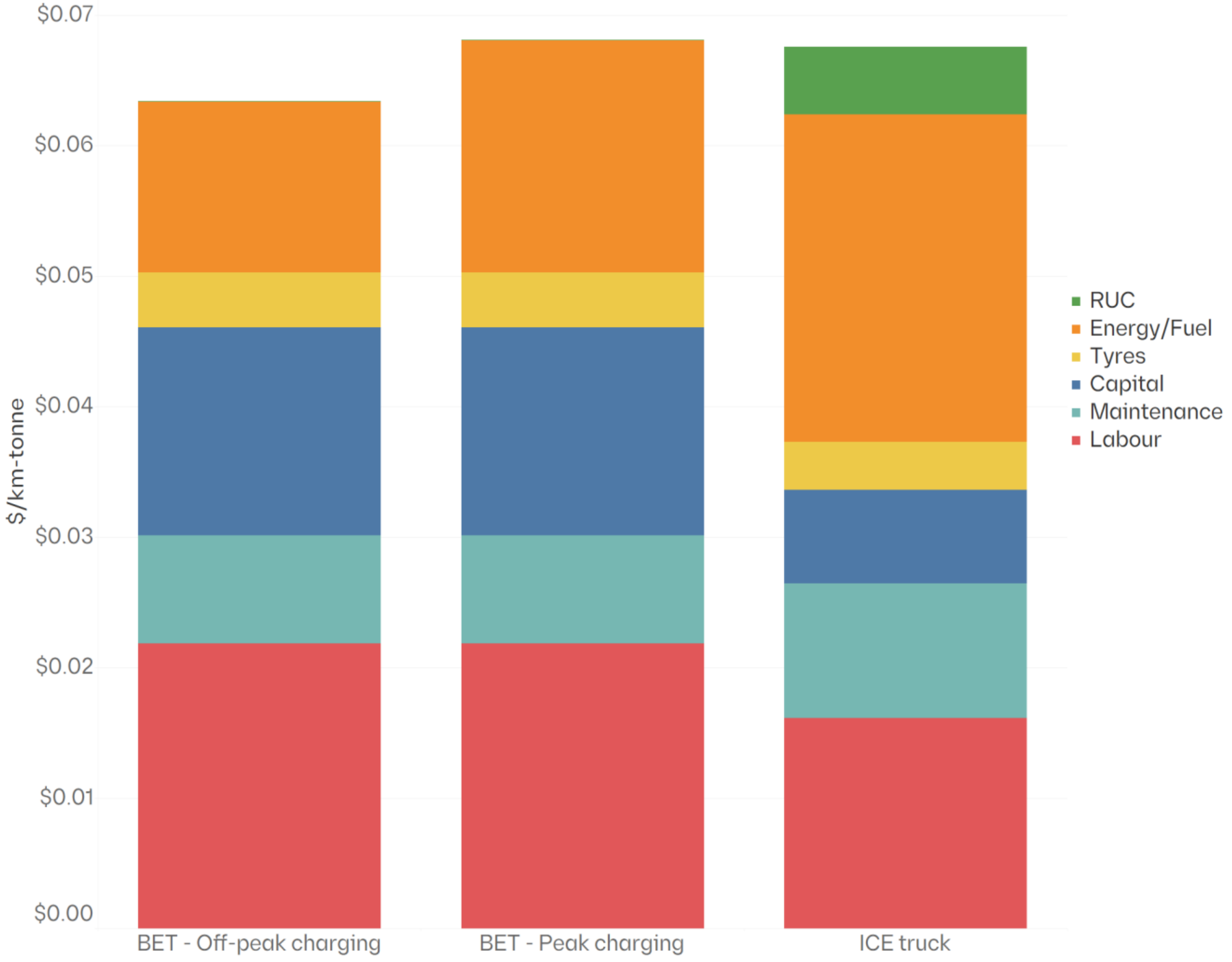
BET Off-peak charging

Cost per trip: $2,146

Cost per tonne-kilometre: 6.34 cents



Cost stack of a BET and ICE truck for a 1000km Brisbane to Sydney trip



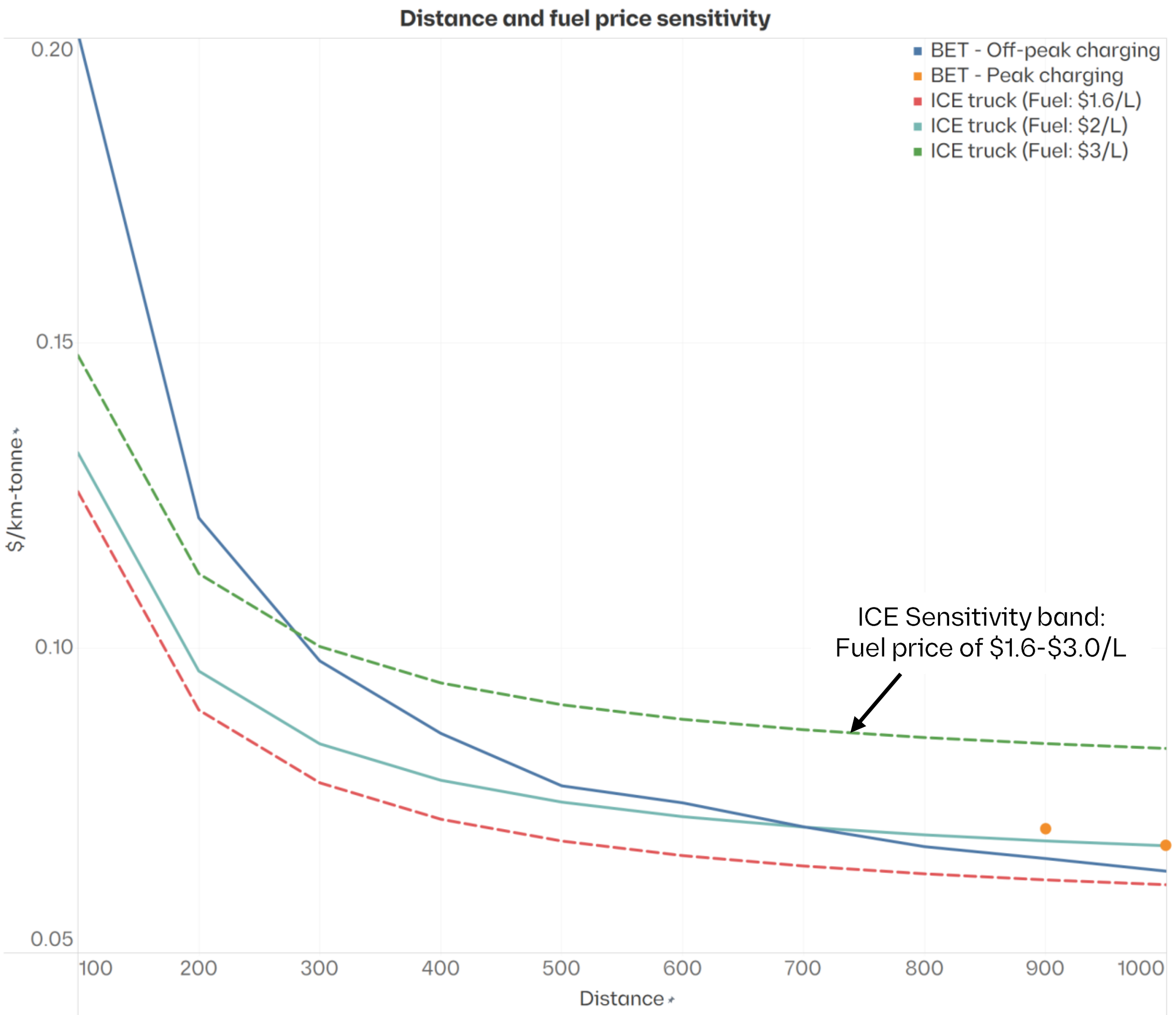
Cost parity is achieved at around 700 kilometres

Trip length impacts the unit cost per tonne-kilometre. ICE trucks maintain a cost advantage over shorter distances, with baseline cost parity between the BET and the diesel equivalent achieved at approximately 700 km per day. However, this parity threshold is highly sensitive to fuel pricing. Under scenarios where global supply constraints sustain diesel prices above $3 per litre, cost parity could be achieved at distances under 300 kilometres per day.

For B-double configurations typical of long-haul freight, extended travel distances enable operators to average down fixed costs, improving the relative performance of the electric vehicle. These findings suggest that heavy vehicle electrification could also be viable for long-haul, interstate routes. Our modelling indicates that higher travel distances improve the cost-effectiveness of heavy-duty electric trucks, contingent on the availability of adequate en-route charging infrastructure.

Our analysis assumes both the ICE and BET vehicles travel the same distance per day. In practice, this assumption likely understates the cost advantage of diesel incumbents. An ICE truck completing a 1,000-kilometre interstate run retains the flexibility to undertake additional tasks within the same working day, whereas a BET requires charging downtime that constrains its daily utilisation.

Recognising the above, several Australian companies – including Solarh2e and Janus Electric – are investigating battery swapping and fast charging technologies to reduce the downtime associated with BET operations. These approaches improve the operational flexibility of BETs, and also facilitate more strategic charging behaviour: operators can schedule charging during periods of low electricity prices and, where enabled, participate in vehicle-to-grid (V2G) arrangements that provide additional revenue or grid support benefits.



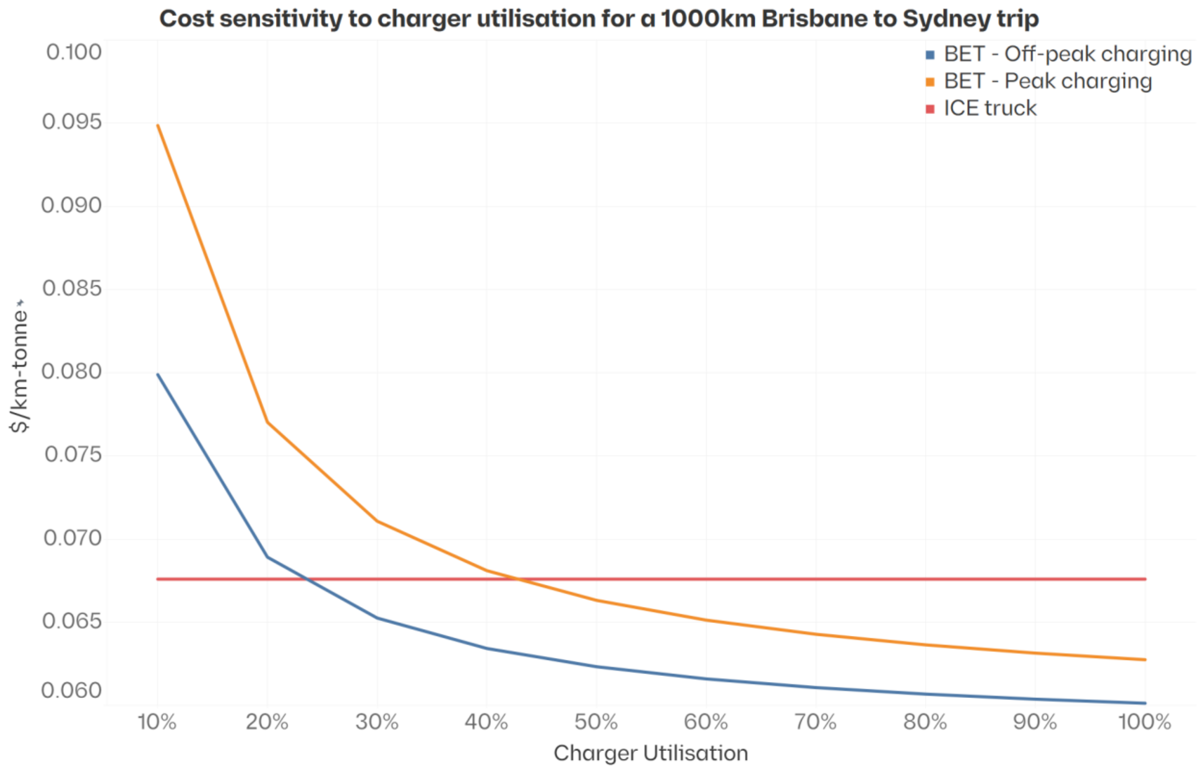
Distance and fuel price sensitivity

ICE Sensitivity band:
Fuel price of $1.6-$3.0/L

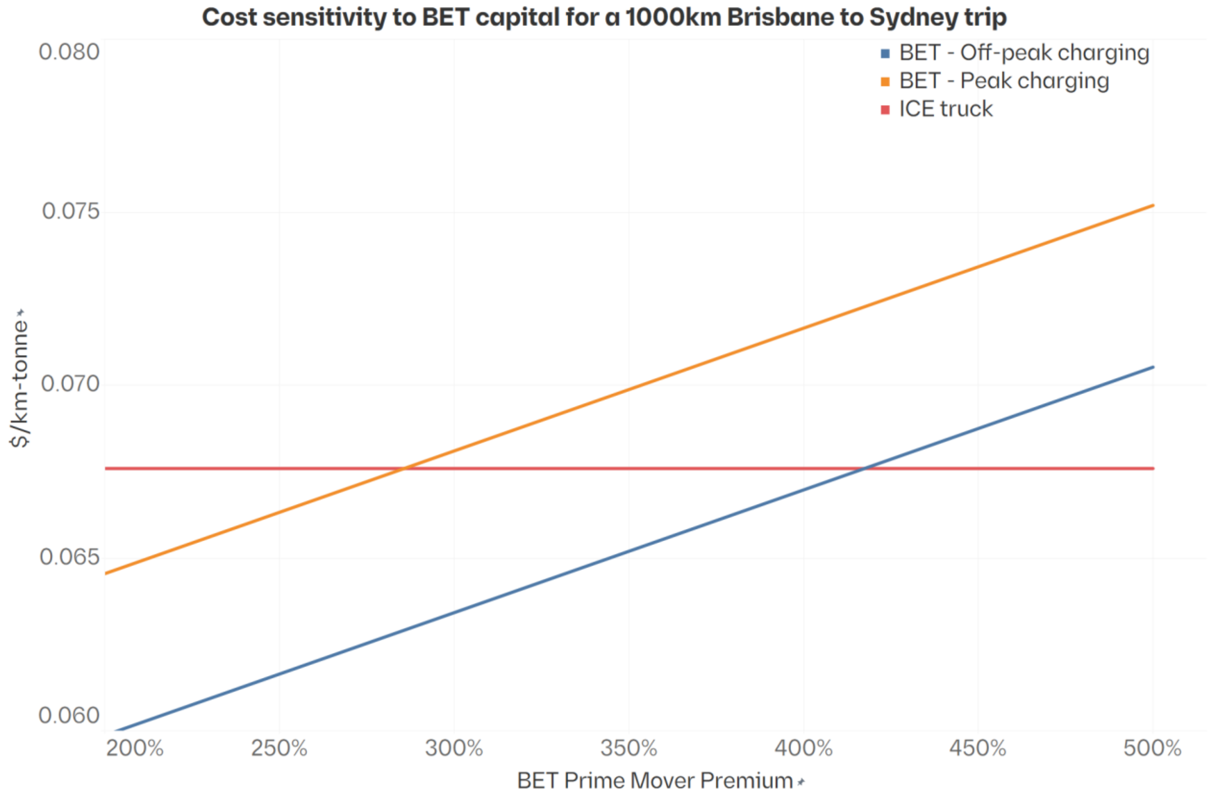
Electric trucks maintain cost parity at low charger utilisation rates and high capital premiums

An important sensitivity is the utilisation rate of the en-route charging infrastructure. The baseline model assumes a 40% utilisation rate per charging bay, equating to 9.6 hours of active use per day. Sensitivity analysis indicates that parity with the diesel baseline is dependent on this metric; the BET breaks even at a 43% utilisation rate under peak charging conditions and a 23% utilisation rate under off-peak charging conditions.

Lower utilisation rates increase the energy cost per trip, as fixed installation costs and network capacity tariffs must be distributed across fewer vehicles.


Cost sensitivity to charger utilisation for a 1000km Brisbane to Sydney trip

The model also tests sensitivity to the capital cost premium applied to the battery electric prime mover. Cost parity is maintained even if the electric prime mover costs 420% more than the diesel equivalent under off-peak charging conditions, or 280% more under peak charging. This indicates that the unit cost per tonne-kilometre is relatively insensitive to initial capital expenditure, as the long travel distance effectively amortises the higher acquisition cost over a large volume of revenue kilometres.


Cost sensitivity to BET capital for a 1000km Brisbane to Sydney trip

04

Implications and recommendations

Operators may actively manage wholesale electricity market risk

The shift from diesel to electricity introduces a material risk: exposure to wholesale electricity market volatility. Wholesale electricity prices in the NEM are reset every five minutes and can range from negative $1,000 per MWh to more than $20,000 per MWh. The diagram below shows spot price outcomes for NSW between December 2024 to December 2025.

How electricity is priced for commercial customers

Retail customers are typically shielded from this volatility because retailers hedge on their behalf, offering a fixed or time of use tariff in return for a risk premium embedded in the retail price. For large commercial customers, pass-through contracts are more common — directly exposing operators to wholesale price movements but also creating the opportunity to reduce costs by timing consumption away from high-price periods and managing hedging positions directly. Given the heavy vehicle sector's thin operating margins, active energy cost management may be adopted by some operators to provide an additional revenue stream, such as via Vehicle-to-grid (V2G) technology. Conversely, operators may require predictable energy costs. The practical application of V2G and energy arbitrage is constrained by operational realities, such as the double-shifting of vehicles and strict freight scheduling requirements. However, this could be enabled with battery swapping technology and/or fast charging solutions.

Key risk management levers

Operators have several tools available to manage their risks: scheduling charging around low-price windows (as demonstrated in our modelling); entering cap or swap contracts to manage price spike exposure; and investing in depot-based battery storage to decouple charging time from market conditions. Wholesale prices also vary materially by season, and commercial contracts will need to account for this, such as through seasonal pricing structures.

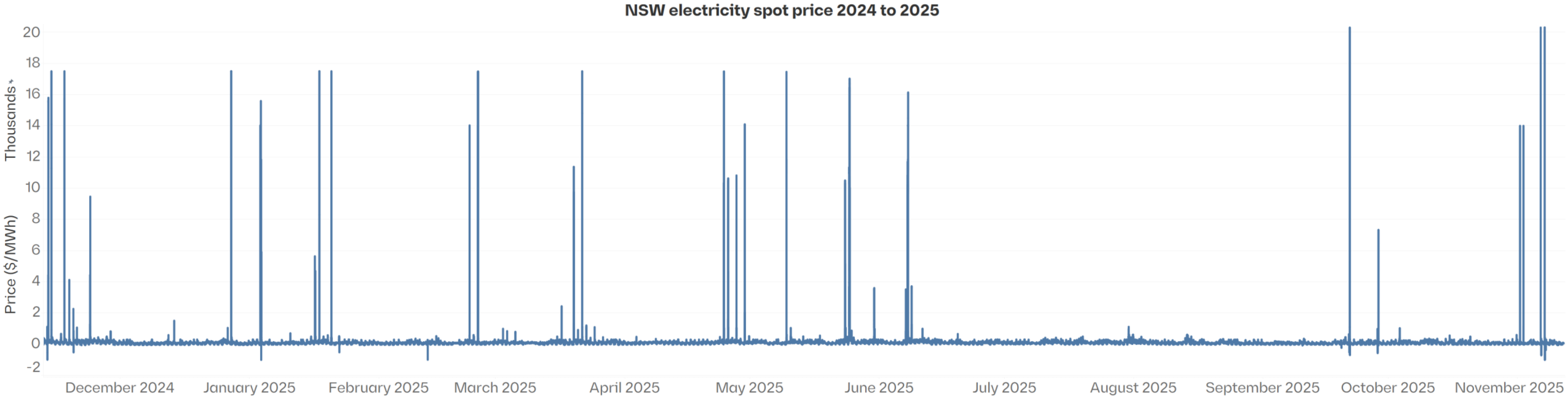


Chart data from AEMO 2025. Aggregated price and demand data.

Structural barriers limit the uptake of BETs in Australia

While our underlying analysis assumes public charging is available and excludes existing regulatory barriers or road user charges (RUC), several structural barriers currently constrain the uptake of battery electric trucks (BETs) in Australia.

Charging infrastructure and model availability

The lack of a public fast-charging network for heavy vehicles on key interstate corridors restricts operations. Heavy BETs require high-capacity chargers and cannot use the existing light vehicle network. Regional grid capacity constraints could exacerbate this issue, and the domestic supply of long-haul BET models remains limited.

Fatigue management compliance

Heavy vehicle fatigue regulations classify recharging as work time. A BET trip on the Brisbane to Sydney corridor, requiring multiple charging stops, exceeds the standard 12-hour maximum work period. To maintain compliance, operators will need to operate under a fatigue management scheme, an administrative requirement not applicable to diesel equivalents.

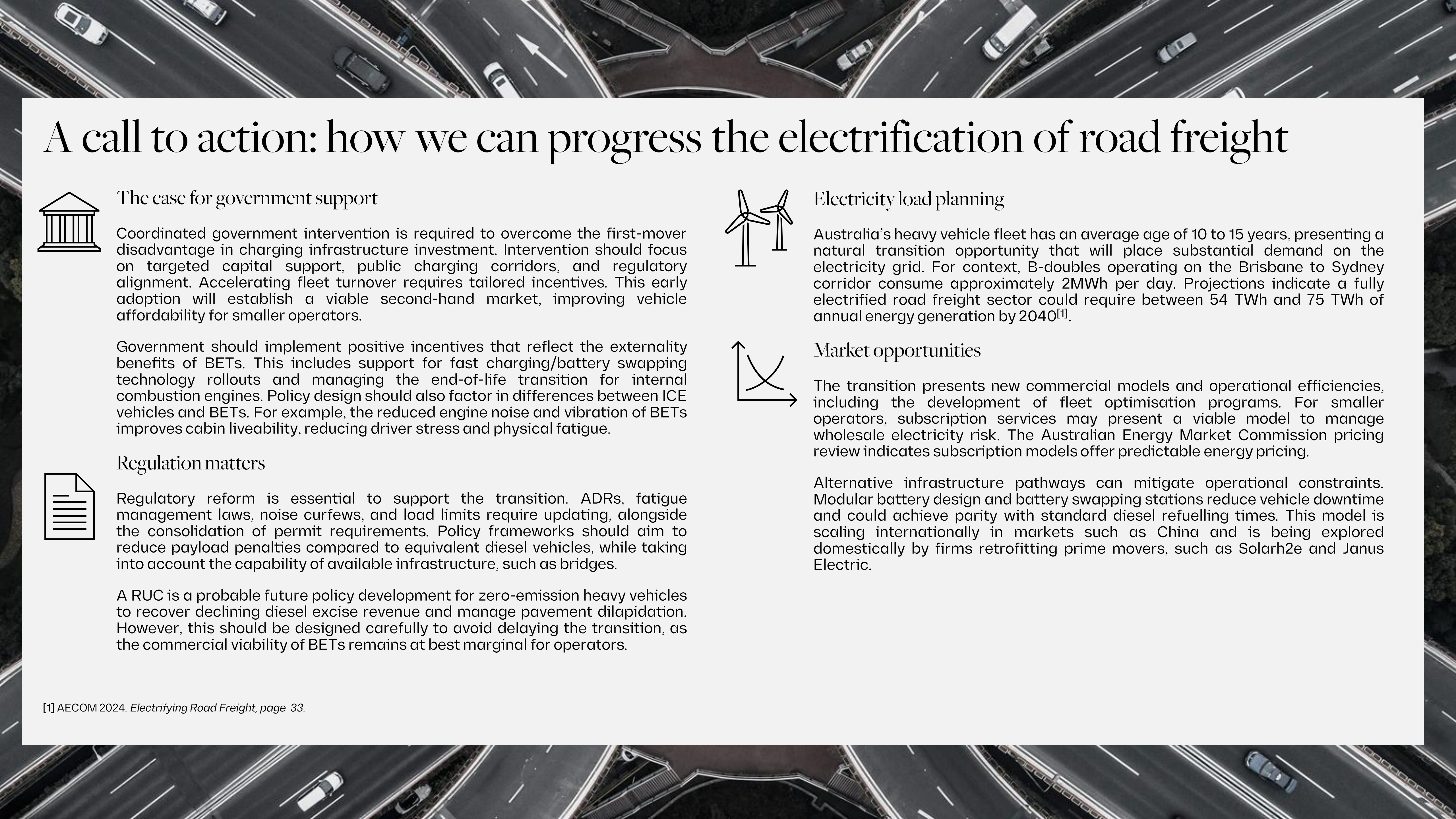
Design rules and access

A disconnect between global standards and Australian Design Rules (ADRs) requires costly re-engineering to import international BET models. While overseas jurisdictions have amended access rules to accommodate heavier electric batteries, Australia maintains fragmented mass and access requirements. This includes regulatory variations between Western Australia, the Northern Territory, and states operating under the Heavy Vehicle National Law (HVNL). Within HVNL jurisdictions alone, operators must navigate five distinct state-level access schemes alongside 530 separate local government restrictions.[1]

Market structure and capital constraints

The freight industry holds significant cultural influence, characterised by low barriers to entry and deeply entrenched expertise in diesel propulsion across maintenance and support networks. With 70% of operators owning a single truck [2] and margins of 2% [3], most of the market lacks the capital to fund fleet electrification or invest in private charging infrastructure. While fluctuating diesel prices and oil security concerns serve as a catalyst for operators to explore alternatives, the transition presents a natural reform trigger for the sector.

[1] Electric Vehicle Council 2025. *State of Electric Vehicles, page 85.* [2] Electric Vehicle Council 2022. *Electric trucks: Keeping shelves stocked in a net zero world, page 5.* [3] AECOM 2024. *Electrifying Road Freight, page 6.*



A call to action: how we can progress the electrification of road freight

The case for government support

Coordinated government intervention is required to overcome the first-mover disadvantage in charging infrastructure investment. Intervention should focus on targeted capital support, public charging corridors, and regulatory alignment. Accelerating fleet turnover requires tailored incentives. This early adoption will establish a viable second-hand market, improving vehicle affordability for smaller operators.

Government should implement positive incentives that reflect the externality benefits of BETs. This includes support for fast charging/battery swapping technology rollouts and managing the end-of-life transition for internal combustion engines. Policy design should also factor in differences between ICE vehicles and BETs. For example, the reduced engine noise and vibration of BETs improves cabin liveability, reducing driver stress and physical fatigue.

Regulation matters

Regulatory reform is essential to support the transition. ADRs, fatigue management laws, noise curfews, and load limits require updating, alongside the consolidation of permit requirements. Policy frameworks should aim to reduce payload penalties compared to equivalent diesel vehicles, while taking into account the capability of available infrastructure, such as bridges.

A RUC is a probable future policy development for zero-emission heavy vehicles to recover declining diesel excise revenue and manage pavement dilapidation. However, this should be designed carefully to avoid delaying the transition, as the commercial viability of BETs remains at best marginal for operators.

Electricity load planning

Australia's heavy vehicle fleet has an average age of 10 to 15 years, presenting a natural transition opportunity that will place substantial demand on the electricity grid. For context, B-doubles operating on the Brisbane to Sydney corridor consume approximately 2MWh per day. Projections indicate a fully electrified road freight sector could require between 54 TWh and 75 TWh of annual energy generation by 2040[1].

Market opportunities

The transition presents new commercial models and operational efficiencies, including the development of fleet optimisation programs. For smaller operators, subscription services may present a viable model to manage wholesale electricity risk. The Australian Energy Market Commission pricing review indicates subscription models offer predictable energy pricing.

Alternative infrastructure pathways can mitigate operational constraints. Modular battery design and battery swapping stations reduce vehicle downtime and could achieve parity with standard diesel refuelling times. This model is scaling internationally in markets such as China and is being explored domestically by firms retrofitting prime movers, such as Solarh2e and Janus Electric.

---

[1] AECOM 2024. *Electrifying Road Freight, page 33.*

Where to from here and how Endgame Analytics can assist

This report is Endgame Analytics' second instalment on decarbonising transport, focusing on Australia's growing road freight task. While the heavy vehicle transition remains in its early stages, this analysis demonstrates that BETs could be a viable solution for long-haul electrification.

The convergence of the electricity and transport sectors establishes a bi-directional relationship where electricity dynamics dictate logistics costs. With readily available charging infrastructure, cost parity for long-haul freight is emerging and will improve alongside technological advancements. Operators can optimise charging behaviour to maintain viability, capitalising on the commercial opportunities presented by BETs, and may even earn revenue through V2G.

Our Next Focus

Our next instalment will examine the implications of the electrification of the fleet for electricity distribution networks.

Get in Touch

Endgame Analytics is helping clients navigate these interactions between policy, technology, and economic strategy.

Martin Chow, Director, E: martin.chow@endgameanalytics.com.au

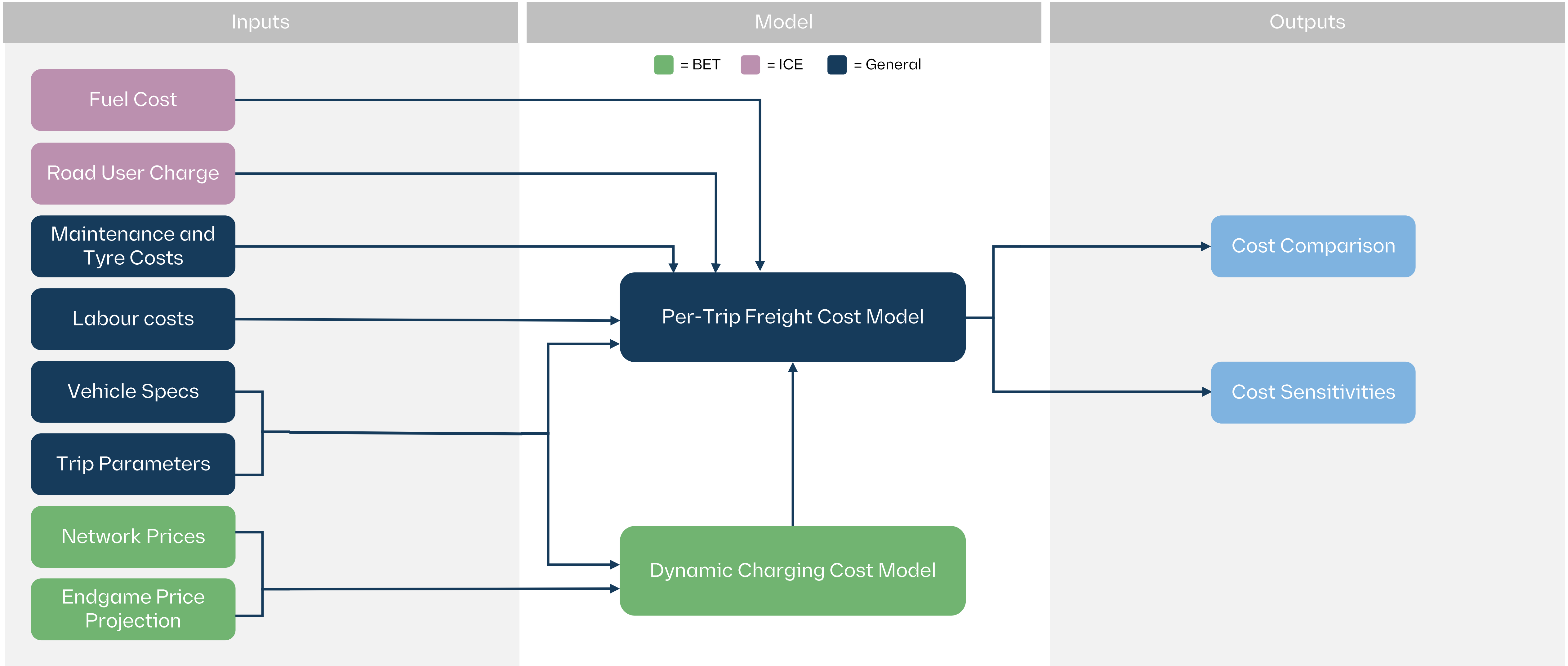
Isaac Mann, Consultant, E: isaac.mann@endgameanalytics.com.au



05

Appendix 1: Truck and Wholesale Model Overview

Outline of operating cost model for ICE and EV trucks



Inputs

Model

Outputs

🟩 = BET 🟪 = ICE ⬛ = General

Fuel Cost

Road User Charge

Maintenance and Tyre Costs

Labour costs

Vehicle Specs

Trip Parameters

Network Prices

Endgame Price Projection

Per-Trip Freight Cost Model

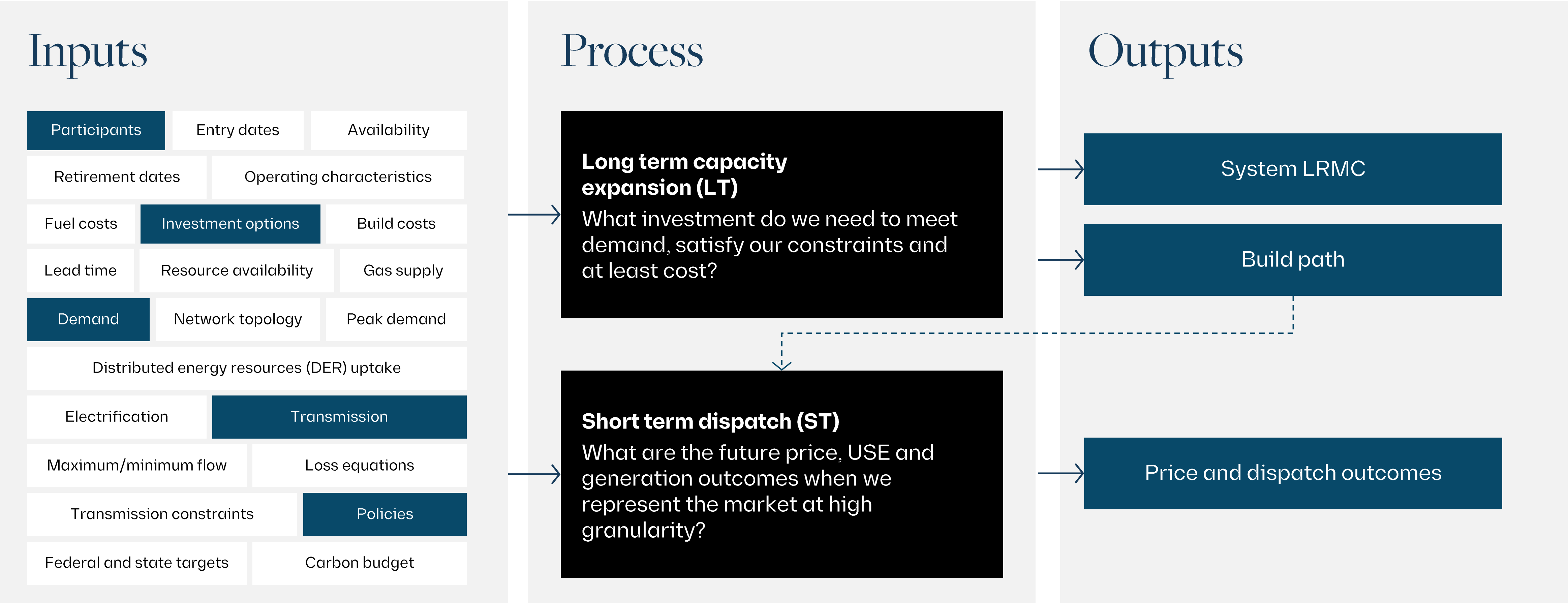
Dynamic Charging Cost Model

Cost Comparison

Cost Sensitivities

We model various scenario outlooks using industry best practice

Electricity market modelling is a multi-stage process from least-cost capacity expansion to economic dispatch.



Inputs

- **Participants**
  - Entry dates
  - Availability
  - Retirement dates
  - Operating characteristics
  - Fuel costs
- **Investment options**
  - Build costs
  - Lead time
  - Resource availability
  - Gas supply
- **Demand**
  - Network topology
  - Peak demand
  - Distributed energy resources (DER) uptake
  - Electrification
- **Transmission**
  - Maximum/minimum flow
  - Loss equations
  - Transmission constraints
- **Policies**
  - Federal and state targets
  - Carbon budget

Process

Long term capacity expansion (LT)
What investment do we need to meet demand, satisfy our constraints and at least cost?

Short term dispatch (ST)
What are the future price, USE and generation outcomes when we represent the market at high granularity?

Outputs

System LRMC

Build path

Price and dispatch outcomes

Endgame scenarios capture credible and realistic assumptions to assess risk

In addition to AEMO scenarios, our wholesale market model also assesses several in-house scenarios. We have used our Headwinds scenario to model the BET charging wholesale prices in this paper.

High level input assumptions

Detailed assumptions for each category are provided in the Appendix

	Gold Rush	**Headwinds**	**Sunny Side Up**
	Investment is dominated by solar and storage, underpinned by CIS delivery subject to build limits.	**Economic coal retirements slow the transition with difficult headwinds in developing wind generation.**	**Significant barriers of wind entry drive prices upwards with a system built on solar and storage alone.**
Demand	ESOO 2025 Step Change with Endgame house adjustments	ESOO 2025 Step Change with Endgame house adjustments	ESOO 2025 Step Change with bearish data centre growth and industrial load closures
Supply	2 GW/p.a. ramping wind limit, 5 GW/p.a. solar limit	2 GW/p.a. ramping wind limit, 3 GW/p.a. solar limit	1 GW/p.a. wind limit, 5 GW/p.a. solar limit
Coal exit	Explicitly modelled coal exit (NSW and VIC near end of technical life)	Explicitly modelled coal exit (NSW and VIC near end of technical life)	Explicitly modelled coal exit (NSW and VIC near end of technical life), further delays in QLD coal exit
Policies	CIS enforced by FY32 subject to entry limits, NSW Roadmap enforced by FY30	No explicit generation targets enforced	No explicit generation targets enforced
Transmission	Endgame house delays to transmission projects	Endgame house delays to transmission projects	Endgame house delays to transmission projects